

CLAIMS

I/We claim:

- [c1] 1. An aircraft system, comprising:
an inlet housing having a lip;
a wiper positioned at the lip and movable relative to the lip; and
a drive assembly positioned at least partially within the inlet housing and operably coupled to the wiper, the drive assembly being configured to move the wiper relative to the inlet housing to remove material from at least a portion of the lip.
- [c2] 2. The system of claim 1 wherein:
the inlet housing further includes an interior surface and an exterior surface radially outward of the interior surface;
the wiper includes a first end portion at least proximate to the interior surface and a second end portion at least proximate to the exterior surface; and
the system further comprises a first attachment device coupling the first end portion to the inlet housing and a second attachment device coupling the second end portion to the inlet housing.
- [c3] 3. The system of claim 1 wherein:
the wiper includes a first end portion and a second end portion opposite the first end portion;
the system further comprises an attachment device coupled to the first end portion of the wiper; and
the drive assembly includes an annular member coupled to the attachment device and a motor operably coupled to the annular member to move the annular member and the first end portion of the wiper relative to the inlet housing.

[c4]

4. The system of claim 1 wherein:

the wiper includes a first end portion and a second end portion opposite the first end portion;

the system further comprises an attachment device coupled to the first end portion of the wiper;

the drive assembly includes an annular member coupled to the attachment device and a motor operably coupled to the annular member to move the annular member and the first end portion of the wiper relative to the inlet housing; and

the annular member includes a strap, a cable, a chain, and/or a ring.

[c5]

5. The system of claim 1 wherein:

the wiper includes a first end portion and a second end portion opposite the first end portion;

the system further comprises an attachment device coupled to the first end portion of the wiper; and

the drive assembly includes a cart movable within the inlet housing and operably coupled to the attachment device to move the first end portion of the wiper.

[c6]

6. The system of claim 1 wherein:

the wiper includes a first end portion and a second end portion opposite the first end portion;

the system further comprises an attachment device coupled to the first end portion of the wiper, the attachment device having a first magnet; and

the drive assembly includes a cart having a second magnet and being movable relative to the inlet housing, the first and second magnets being positioned to interact so that the attachment device moves with the cart.

[c7] 7. The system of claim 6 wherein the wiper is configured to fail at a force less than a force required to dislodge the attachment device.

[c8] 8. The system of claim 1 wherein:
the wiper includes a first end portion coupled to the drive assembly and a second end portion opposite the first end portion; and
the system further comprises a drag member having a first portion coupled to the second end portion of the wiper and a second portion opposite the first portion, the drag member being movable between a stowed position and a deployed position, with the second portion of the drag member being unsecured to the inlet housing when the drag member is in the deployed position.

[c9] 9. The system of claim 1 wherein:
the wiper includes a first end portion coupled to the drive assembly and a second end portion opposite the first end portion;
the system further comprises a drag member having a first portion coupled to the second end portion of the wiper and a second portion opposite the first portion, the drag member being movable between a stowed position and a deployed position, with the second portion of the drag member being unsecured to the inlet housing when the drag member is in the deployed position; and
the inlet housing has a recess sized and positioned to receive the drag member in the stowed position.

[c10] 10. The system of claim 1 wherein the wiper includes a wire.

[c11] 11. The system of claim 1 wherein the wiper includes a strap.

- [c12] 12. The system of claim 1, further comprising an axially resilient member positioned to provide tension to the wiper as the wiper moves relative to the inlet housing during a cleaning cycle.
- [c13] 13. The system of claim 1, further comprising a cleaning fluid reservoir and a fluid conduit in fluid communication with the wiper and the fluid reservoir to provide cleaning fluid to the wiper.
- [c14] 14. The system of claim 1 wherein:
the wiper includes a wicking material to move cleaning fluid through at least a portion of the wiper; and
the system further comprises a cleaning fluid reservoir in fluid communication with the wicking material.
- [c15] 15. The system of claim 1 wherein:
the inlet housing further includes a first portion, a second portion, and a groove between the first and second portions; and
the drive assembly is configured to move the wiper from a stowed position in which the wiper is received at least partially in the groove and a deployed position in which the wiper is external to the groove.
- [c16] 16. The system of claim 1 wherein:
the lip of the inlet housing has a contour; and
the wiper is flexible to generally conform to the contour of the lip.
- [c17] 17. The system of claim 1 wherein:
the lip has a generally annular configuration; and
the drive system is configured to move the wiper around the annular lip.

[c18] 18. The system of claim 1 wherein the drive assembly is configured to move the wiper relative to the inlet housing to remove material during flight at an air speed of greater than 100 mph.

[c19] 19. The system of claim 1, further comprising:
a wing coupled to the inlet housing;
a fuselage attached to the wing; and
a tail coupled to the fuselage.

[c20] 20. The system of claim 1 wherein the wiper includes:
a body having a carrier and a plurality of discrete cleaning elements attached to the carrier; and
a cord coupled to the carrier and the drive assembly to move the wiper relative to the inlet housing.

[c21] 21. An aircraft system, comprising:
a contoured exterior aircraft surface defining a leading edge;
a wiper having a first end portion, a second end portion, and a body extending between the first and second end portions, with at least a portion of the body contacting the leading edge; and
a drive assembly operably coupled to at least one of the first and second end portions to move the wiper relative to the surface to remove material from the leading edge during flight at an air speed of greater than 100 mph.

[c22] 22. The system of claim 21, further comprising an attachment device coupled to the first end portion of the wiper, wherein the drive assembly includes an annular member connected to the attachment device and a motor operably coupled to the annular member to move the annular member and the first end portion of the wiper relative to the leading edge.

- [c23] 23. The system of claim 21, further comprising:
an inlet housing including the contoured exterior aircraft surface; and
an attachment device coupled to the first end portion of the wiper;
wherein the drive assembly includes a cart movable within the inlet housing
and operably coupled to the attachment device to move the first end
portion of the wiper.
- [c24] 24. The system of claim 21 wherein the body of the wiper includes at
least one of a wire and a strap.
- [c25] 25. The system of claim 21 wherein the drive assembly includes:
a first motor operably coupled to the first end portion of the wiper to move
the first end portion relative to the surface; and
a second motor operably coupled to the second end portion of the wiper to
move the second end portion relative to the surface.
- [c26] 26. The system of claim 21, further comprising:
a wing coupled to the inlet housing;
a fuselage attached to the wing; and
a tail coupled to the fuselage.
- [c27] 27. An aircraft system, comprising:
an inlet housing having a lip;
wiping means for removing material from at least a portion of the lip during
flight; and
driving means for moving the wiping means relative to the lip, the driving
means being operably coupled to the wiping means and positioned
at least partially within the inlet housing.
- [c28] 28. The system of claim 27 wherein the wiping means includes at least
one of a wire and a strap.

- [c29] 29. The system of claim 27 wherein the driving means includes:
an annular member coupled to the wiping means; and
a motor operably coupled to the annular member to move the annular member and the wiping means relative to the lip.
- [c30] 30. The system of claim 27 wherein the driving means includes a cart movable within the inlet housing and operably coupled to the wiping means to move the wiping means relative to the lip.
- [c31] 31. The system of claim 27 wherein:
the inlet housing further includes an interior surface and an exterior surface radially outward of the interior surface; and
the wiping means includes a first wiping portion for wiping at least a portion of the interior surface and a second wiping portion for wiping at least a portion of the exterior surface.
- [c32] 32. An aircraft system, comprising:
an inlet housing having an exterior surface, an interior surface radially inward of the exterior surface, and a lip surface extending between the exterior and interior surfaces;
a wiper having a first end portion proximate to the interior surface, a second end portion proximate to the exterior surface, and a body extending between the first and second end portions, the body being flexible to generally conform to the lip surface;
an attachment device coupled to the first end portion of the wiper; and
a drive assembly including an annular member operably coupled to the attachment device and a motor operably coupled to the annular member to move the wiper across the inlet housing and remove insects from at least a portion of the lip surface during flight.

[c33] 33. The system of claim 32 wherein the wiper includes at least one of a wire and a strap.

[c34] 34. The system of claim 32 wherein:
the attachment device is a first attachment device;
the system further comprises a second attachment device attached to the second end portion of the wiper; and
the drive assembly further includes a cart movable within the inlet housing and operably coupled to the second attachment device to move the second end portion of the wiper.

[c35] 35. The system of claim 32 wherein:
the lip surface has a generally annular configuration; and
the drive system is configured to move the wiper around the annular lip surface.

[c36] 36. A flow system, comprising:
a body having a flow surface;
a wiper having a filament; and
a drive assembly at least partially within the body and operably coupled to the wiper to move the filament relative to the body to remove material from the flow surface.

[c37] 37. The flow system of claim 36 wherein the filament comprises a wire.

[c38] 38. The flow system of claim 36 wherein the flow body further comprises a leading edge.

[c39] 39. A method of manufacturing a wiping system for use on an aircraft engine inlet housing, the inlet housing having an interior surface, an exterior

surface, and a lip surface extending between the interior and exterior surfaces, the method comprising:

coupling a wiper to the inlet housing with a first end portion of the wiper at least proximate to the interior surface and a second end portion of the wiper at least proximate to the exterior surface; and
coupling a drive assembly to the wiper to move the wiper relative to the inlet housing to remove material from the lip surface during flight.

[c40] 40. The method of claim 39 wherein coupling the wiper includes coupling at least one of a strap and a wire to an attachment device.

[c41] 41. The method of claim 39 wherein:
coupling the wiper includes attaching an attachment device to the first end portion of the wiper; and
coupling the drive assembly includes operably coupling the drive assembly to the attachment device.

[c42] 42. The method of claim 39 wherein coupling the wiper includes:
attaching a first attachment device to the first end portion of the wiper, the first attachment device being coupled to the inlet housing; and
attaching a second attachment device to the second end portion of the wiper, the second attachment device being coupled to the inlet housing.

[c43] 43. The method of claim 39 wherein coupling the drive assembly includes:
coupling an annular member to the first end portion of the wiper; and
coupling a motor to the annular member to move the annular member and the first end portion of the wiper relative to the inlet housing.

[c44] 44. The method of claim 39, further comprising coupling an axially resilient member to the wiper to provide tension to the wiper as the wiper moves relative to the inlet housing during a cleaning cycle.

[c45] 45. The method of claim 39, further comprising coupling a cleaning fluid reservoir to the wiper to provide cleaning fluid to the wiper during a cleaning cycle.

[c46] 46. The method of claim 39 wherein coupling the drive assembly to the wiper comprises positioning the drive assembly to move the wiper along an annular path.